cians learn the capabilities and limitations of modern medical science and technology during this period of their preparation for practice whether it will be in such centers or elsewhere. Decentralized on-the-job training in limited practice situations cannot be substituted for active participation in broadly based learning experience with scientific medicine at its best.

¶ *The matter of who is responsible and who is rendering services to an individual patient in the graduate medical education setting needs to be clarified.* Graduate medical education is that segment of a physician's training between medical school where he has no responsibility and active practice where he has full responsibility. During this period the young physician must assume increasing decision making and practice responsibility as part of his training, and in so doing it turns out that he actually delivers approximately 25 percent of all the medical care given in the nation. Yet just who to be held responsible to the patient for what or who should be paid for what is not as clear as it should be.

¶ *The need for better distribution of physicians among the specialties including family practice must be satisfied.* Here the needs of a major medical center for a distribution of specialties for a balanced program of graduate medical education and the tertiary care the above render are quite different from the distribution or balance which is desirable in an urban or rural practice situation where the emphasis is on primary and secondary care. This disparity is to a considerable extent responsible for the present maldistribution of specialties in practice and it should have considerably more study and attention.

¶ *There is a clear need for more realistic financing of graduate medical education.* The costs are substantial and are increasing. They can no longer be borne by the sick patient who happens to be in a hospital with a fully developed house staff. So far the private sector has found no adequate solution for this; and if it does not, there will be increased public funding, and with it increased bureaucratic and political control of what is taught, where it is taught, to whom it is taught and all that this entails.

The enormity and implications of all these problems in graduate medical education are not generally realized, nor is their complexity, nor is the awkwardness of the organizational mechanisms we have for dealing with them. Quite recently a Liaison Committee on Graduate Medical Education has come into being, sponsored by the American Medical Association, the American Board of Medical Specialties, the Association of American Medical Colleges, the Council on Medical Specialty Societies and the American Hospital Association. It has representation from each of these organizations and one representative from the public and one from the federal government. Its thrust is to be in the field of accreditation of graduate medical education and specialty training where the problems are great and it is possible that such a liaison committee can be effective.

But the sad truth is that there is as yet no recognizable mechanism to deal constructively with the problems of graduate medical education herein described, from the standpoint of the needs of practice situations, of educational institutions, or of the growing public concern with the educational product, and with the need for adequate resources, financial and otherwise, for graduate medical education.

The initiative is up for grabs.

—MSMW

Antimicrobial Drugs and Adverse Drug Reactions

TWENTY TO FORTY PERCENT OF PATIENTS treated in hospitals receive at least one antibiotic, and a significant proportion of them receive two or more. The frequency of use of antimicrobials in the treatment outside hospitals probably is less, but these agents are now and will continue to represent a large proportion of the drugs prescribed by physicians.

An increasing number of new antimicrobial drugs have become available yearly and are added annually to the large number already available. This number is magnified by the variety of different products with different names

but representing the same drugs. For example, there are at least 37 different tetracycline products available and each is often marketed as having attributes more advantageous than others.

Antimicrobial drugs certainly have important therapeutic functions when used for treatment of characterized and defined infections. Too often, however, they are prescribed unwisely and without justification. Infections by a few specific microorganisms can be prevented by prophylactic use of particular antimicrobial drugs, but antibiotics are not effective in preventing infection in general, and when used for such purposes more often increase the risk of infection, particularly by antibiotic resistant microorganisms. Physicians also may prescribe antibiotics when clinical discrimination is imprecise, and these drugs are used to "avoid overlooking an infection and failing to treat it." There are circumstances when empiric antibiotic treatment is justified but more often such treatment is unwise.

The desirable dosage of antimicrobial drugs used to treat patients usually is well known or readily determined. Occasionally, however, antibiotics may be given in too low a dosage, and this may be attributed to their high cost. More often, however, physicians prescribe too large a dose of an antibiotic, particularly if the patient seems very ill. The route of administration may require alteration if a patient is severely ill, particularly if in shock, but the effectiveness of antibiotics is not increased once a dosage has been given which will kill the microorganism or terminate its replication. Bacteria killed with one microgram of an antibiotic will not be killed further with ten micrograms. There is no need to kill a fly with a hammer if a fly-swatter will do. The hammer may in fact cause damage to the fly's host. Similarly, an excessive dose of drug increases the risk of damaging the patient. These comments are also appropriate to the duration of treatment. Once flies have been killed other means than the fly-swatter or hammer must be used to remove their remains and repair the damage they may have caused. Antibiotic treatment may not, and does not, compensate completely for defective host resistance and repair.

The predictability and prevention of adverse drug reactions are related to familiarity with the risks and circumstances responsible for their occurrence. Typhoid fever, for example, will occur unpredictably and will not be prevented if water or food contamination and the typhoid carrier are not recognized as determinants. There are many different determinants of adverse drug reactions. Many are related to particular types of drugs, while other determinants are more generally applicable. The pharmacologic and clinical determinants of adverse drug reactions are discussed in a Specialty Conference on Complications of Antibiotic Therapy which appears elsewhere in these pages. Therefore, only some of the generally important means for their prevention or control will be presented here. Nevertheless, the judicious but restrained use of antibiotics is of primary importance.

Adverse reactions to drugs have become a major public health problem. Estimates have suggested that in the United States several hundred thousand persons a year enter hospitals for drug-induced diseases. The untoward drug effects occurring in ambulatory and hospitalized patients must be added to this number, which emphasizes the magnitude of the difficulty and need for concern.

No drug, including antimicrobial agents, is completely safe, but the reasons why some persons are predisposed to adverse drug effects are incompletely understood. Genetic, metabolic and other determinants are known to be responsible for some drug-induced illnesses, but the determinants of most untoward drug reactions are not known.

Two manipulatable and identifiable determinants of adverse drug reactions are the number of drugs administered to a patient and a previous history of a drug-induced illness. As the number of drugs given to a patient is increased, there is a progressive increase in the risk of an adverse drug reaction. In part, this effect is additive but it is also attributable to potential adverse drug interactions. The probability of drug interaction as a potential cause of untoward effects may be as high as 50 percent in ambulatory patients. This risk is increased as the number of prescribers increases. Avoidance of this risk is dependent upon the physician's being aware of all medications being taken by a patient, not just those personally prescribed.

Patients admitted to the hospital with a drug-induced disease are three times more likely to

have an adverse reaction to another drug during hospitalization. Similarly, patients with a past history of a drug-induced illness are predisposed to additional ones. Repetitive adverse drug reactions are common. Recognition of a drug-induced disease in a patient, therefore, requires added caution in drug prescribing.

Avoidance or prevention of all drug-induced disease is not possible. New, previously unrecognized reactions to old drugs are being described, and new drugs are always a potential source of new reactions. Scrutiny of prescribing practices and of medications taken by patients, careful use of drugs in predisposed patients, and avoidance of excessive drug prescribing are the methods which, diligently followed, can reduce the problems of drug-induced disease.

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AMPAC–CALPAC

AS THIS IS WRITTEN the results of the November 7 state and national elections are not known, and as this is read they likely will be. Hence this is a good time for an objective comment or two about AMPAC and CALPAC.

For some years now these political action committees have been sponsored at the national level (AMPAC) by the American Medical Association and at the state (CALPAC) by the California Medical Association. They have gradually increased in membership and in recent years their dollar contributions to the candidates selected for support have been large enough to be both helpful to the campaign and appreciated by the candidates. Further, we are informed that AMPAC and CALPAC are now able to hold their own at both state and national level with the best of the political action committees no matter whose they are.

It may be of interest to many to know that in the primary election last June and in this November election a total of 136 candidates were supported in California, and the breakdown shows that 74 of them (54%) were Republicans and 62 (46%) were Democrats. Thus any doubts that CALPAC is not bipartisan should be allayed. Since it has become abundantly clear that medicine has problems with government no matter which party is in power, it has become clear also that it is to the advantage of medicine and better medical care, that persons be elected from both parties who are well informed and understand the problems of health care.

It is equally of interest and worth emphasizing that many organizations of diverse and often opposing interests have political action committees which support and then claim the support of candidates after they have been elected to public office. It is naive to assume that many candidates supported by AMPAC or CALPAC are not also supported, and perhaps often better supported, by interests with other views than those of medicine. So it is also naive to assume for one moment that any candidate supported from out of our pockets is henceforth to be counted as in our pockets. However, we can expect to get the ear of candidates we support. But in the long run those in public office are far more influenced by public opinion than anything else, even including money, because that is where the votes are. Political action committees are important but alone they are not enough, and this truth should never be forgotten.

AMPAC and CALPAC have placed medicine in the big leagues as far as this particular form of political persuasion is concerned, and for this the profession is much in their debt. They have by no means yet reached their full potential for influence and effectiveness. They merit the continued financial support of individual members of the profession and the far more active participation of their own members in their councils and decision-making processes.

—MSMW